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CONTROL ID: 709563

TITLE: Physical Processes for Driving Ionospheric Outflows in Global Simulations

PRESENTATION TYPE: Assigned by Commitee (Invited)

SECTION/FOCUS GROUP: SPA-Magnetospheric Physics (SM)

SESSION: System Effects of Ionospheric-Magnetospheric Plasma Redistribution During Storms (SM05)

AUTHORS (FIRST NAME, LAST NAME): Thomas Earle Moore[1], Robert J Strangeway[2]

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Title of Team:

ABSTRACT BODY: We review and assess the importance of processes thought to drive ionospheric outflows, linking them as appropriate to the solar wind and interplanetary magnetic field, and to the spatial and temporal distribution of their magnetospheric internal responses. These begin with the diffuse effects of photoionization and thermal equilibrium of the ionospheric topside, enhancing Jeans' escape, with ambipolar diffusion and acceleration. Auroral outflows begin with dayside reconnexion and resultant field-aligned currents and driven convection. These produce plasmaspheric plumes, collisional heating and wave-particle interactions, centrifugal acceleration, and auroral acceleration by parallel electric fields, including enhanced ambipolar fields from electron heating by precipitating particles. Observations and simulations show that solar wind energy dissipation into the atmosphere is concentrated by the geomagnetic field into auroral regions with an amplification factor of 10-100, enhancing heavy species plasma and gas escape from gravity, and providing more current carrying capacity. Internal plasmas thus enable electromagnetic driving via coupling to the plasma, neutral gas and by extension, the entire body. We assess the importance of each of these processes in terms of local escape flux production as well as global outflow, and suggest methods for their implementation within multi-species global simulation codes. We complete the survey with an assessment of outstanding obstacles to this objective.

KEYWORDS: [2431] IONOSPHERE / Ionosphere/magnetosphere interactions, [2736] MAGNETOSPHERIC PHYSICS / Magnetosphere/ionosphere interactions, [2784] MAGNETOSPHERIC PHYSICS / Solar wind/magnetosphere interactions, [7827] SPACE PLASMA PHYSICS / Kinetic and MHD theory.

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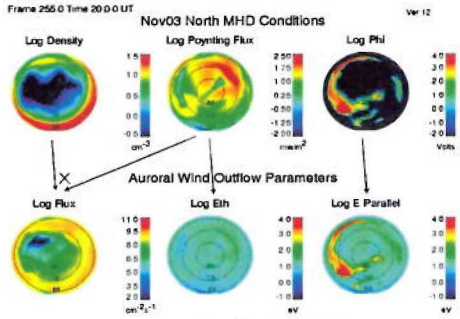

Upper row: parameters derivable from MHD simulations that drive outflows. Lower row: Ion outflow flux, temperature, and parallel velocity derived from the upper row parameters.

Additional Details

Previously Presented Material: 20% at AOGS 2009 in Singapore

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